

TWO NEW SPECIES OF *SOYEDINA* (PLECOPTERA: NEMOURIDAE) FROM THE APPALACHIAN MOUNTAINS¹

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ABSTRACT: Two new Nemouridae are named from the Appalachian Mountains of eastern North America. *Soyedina kondratieffi* and *S. merritti* are described in the male and female adult stages. Illustrations are provided for the important genitalic characters that will separate them from the known species. The new species are only recorded from small geographical areas in North Carolina and Pennsylvania.

While studying the Nemouridae of eastern North America, it became apparent that the genus *Soyedina* contains more species than previously realized. Three species are presently recognized from this region: *Soyedina carolinensis* (Claassen), *S. washingtoni* (Claassen) and *S. vallicularia* (Wu). Claassen (1923) named the first two species from specimens collected in 1877. Wu (1923) then described *S. vallicularia* as part of his doctoral research. Ricker (1952) questioned the status of *S. carolinensis*, but most North American authors have treated it as a valid species (Stark *et al.*, 1986). However, a study of the type specimens indicated that there are two previously undescribed *Soyedina* species in the Appalachian Mountains. One species is known from a small area in Pennsylvania and the other has been recorded from only one locality in North Carolina. This paper provides the descriptions of these two interesting species.

Soyedina kondratieffi, NEW SPECIES

(Figs 1-3)

Male: Macropterous. Length of forewings 6.5-7.5 mm; length of body 5.0-6.0 mm. General color dark brown; legs light brown. Wings fumose, with darker areas near base and at cord; venation typical for genus with veins A₁ and A₂ joined near wing margin. Gills absent. Anterior abdominal terga unmodified. Cerci small, membranous and one segmented. Hypoproct well developed, base broad covering most of ninth sternum, apex narrow and ending in a pointed, lightly sclerotized tip; vesicle narrowest at base, elongate and thin, parallel sided and terminating in rounded tip. Paraprocts with two lobes: inner lobes small, narrow and lightly sclerotized; outer lobes greatly enlarged, darkly sclerotized broadest at base, narrowed at midlength, apical portion forming broad, ax-shaped structure, ending in narrowly pointed tip along concave margin, which margin displays a thin, more darkly sclerotized band reminiscent of an outer paraproctal lobe (Fig. 2). Epiproct short, stout and not completely recurved but directed upward and away from head region; slightly

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asymmetrical, with right half larger than left; ventral sclerites elongate, sausage-shaped, slightly broader near apex, with rounded tips, pointed, sclerotized extension present near base of outer margin; lateral arms short, thin and extending from base of ventral sclerites to darkly sclerotized portion of dorsal sclerite; basal sclerites broad and triangle-shaped; dorsal sclerite with broadly rounded, lightly sclerotized apical portion, open at apex, revealing sclerotized inner structures, basal area of sclerite bearing darkly sclerotized, triangle-shaped bars, which encircle the basal cushion (Figs. 1-2).

Female. Macropterous. Length of forewings 8.0-9.0 mm; length of body 6.0-7.5 mm. Body, appendages and wings similar to male. Subgenital plate well developed, base broad, apex narrowly rounded, extending completely over middle of eighth sternum. Median area of eighth sternum broadly excavated at vaginal opening (Fig. 3).

Diagnosis. *Soyedina kondratieffi* can be distinguished from most described species of *Soyedina* by the shape of the paraprocts, which are narrow apically and terminate in sharply pointed tips along the inner margin. The other species that has apically pointed paraprocts is *S. merritti*, but the tip is near the middle and the whole paraproct is shorter and stouter. *Soyedina kondratieffi* can best be separated from *S. carolinensis* and *S. washingtoni* by its epiproct. The epiproct in both *S. carolinensis* and *S. washingtoni* is long and narrow with small teeth, while it is short, stout and naked in *S. kondratieffi*. Also, the epiproct of *S. kondratieffi* is nearly symmetrical as in the western *S. producta* (Claassen). However, the distinctive, anterior tergal modifications serve to easily identify *S. producta*.

Material. Holotype male and allotype female, North Carolina, Macon County, upper Ball Creek, Coweeta Hydrologic Laboratory, 1,100-1,200 m, 22 February-23 March 1984, A.D. Huryn (malaise trap), deposited at the United States National Museum, Smithsonian Institution, Washington, D.C. Paratypes: 6 males and 19 females, same locality data as holotype; 5 males, 20 March-7 April, deposited at Museum of Natural History, University of Georgia, Athens, Georgia; Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah, and C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado.

Etymology. This species is named in honor of Dr. Boris C. Kondratieff of the Department of Entomology, Colorado State University. He made the first specimens available to the senior author and has provided much support and encouragement over the years during our studies on the stoneflies of eastern North America. In addition, his passion for the stonefly fauna of the southern Appalachian Mountains has been an inspiration to everyone in the field.

Discussion. This species is presently known only from the type locality in North Carolina. The habitat is a headwater stream that is surrounded by seeps (Huryn and Wallace, 1987). The adults were collected in February and March before most entomologists are collecting. Two other *Soyedina* species were also found in the malaise trap samples: *S. carolinensis* in late March and early April and *S. washingtoni* in late April and early May. Additional specimens will probably be collected when biologists search appropriate habitats in the Southern Appalachian Mountains early in the year.

Soyedina merritti, NEW SPECIES

(Figs. 4-6)

Male: Macropterous. Length of forewings 7.0-8.0 mm; length of body 5.0-6.0 mm. General color dark brown; legs light brown. Wings fumose, with darker area near the cord; venation typical

for genus, with veins A_1 and A_2 joined near the outer wing margin. Anterior abdominal terga unmodified. Cerci small, membranous and one segmented. Hypoproct well developed, base broad covering most of ninth sternum, apex narrowing abruptly to lightly sclerotized, thin, pointed tip; vesicle broadest medially and narrowing at base and apex, relatively short and stout, terminating in a rounded tip. Paraprocts with two lobes; inner lobes small, thin and lightly sclerotized; outer lobes greatly enlarged, darkly sclerotized, broadest at base, constricted slightly at midlength, apical portion forming large, distinctive, saber-shaped structures, which appear somewhat like the head of a bird in profile, apex pointed apically and inner margin less concave and almost straight (Fig. 4). Epiproct elongate but very broad, with apex nearly as wide as base, asymmetrical, with right half larger; ventral sclerites long and thin, bearing a few small teeth along outer margins; lateral arms long and thin, extending from base of ventral sclerites to beyond sclerotized base of dorsal sclerite; basal sclerites broad and triangle-shaped; dorsal sclerite with large, lightly sclerotized apical portion that terminates in a broadly rounded apex, open throughout apical two thirds, exposing darkly sclerotized inner structures, basal portion of sclerite composed of large, darkly sclerotized, triangle-shaped bars, which encircle the basal cushion (Figs. 4-5).

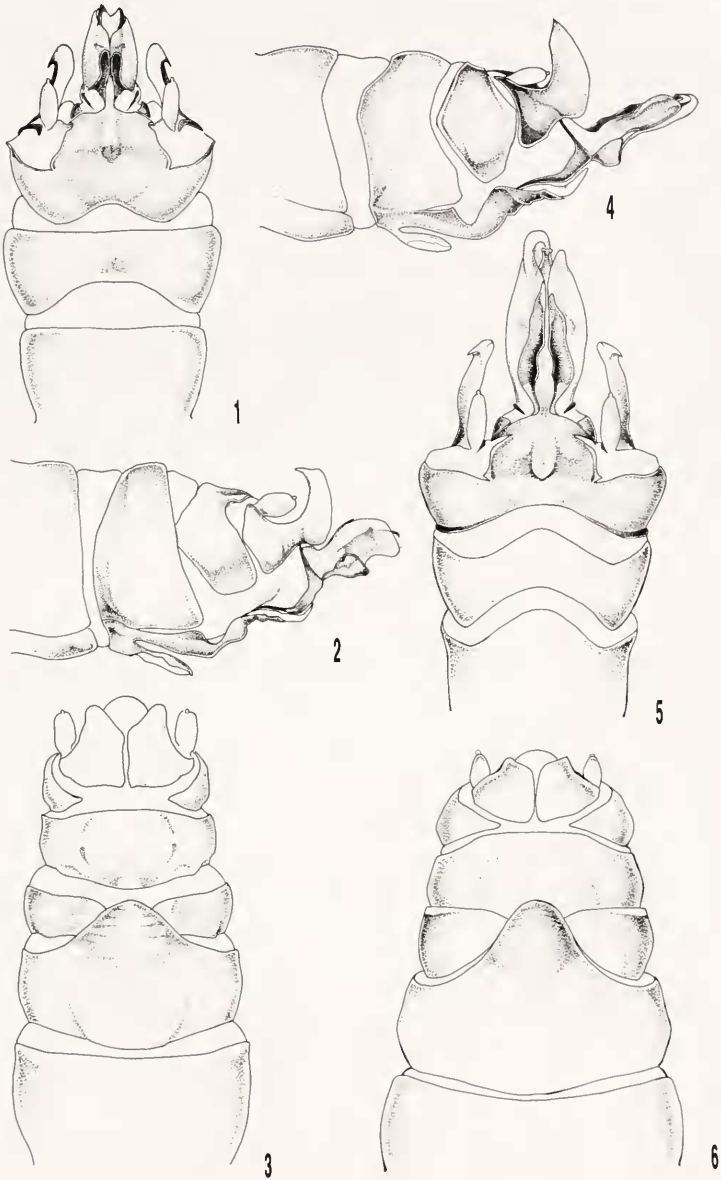
Female. Macropterous. Length of forewings 9.0-10.0 mm; length of body 6.0-8.5 mm. Body, appendages and wings similar to male. Subgenital plate well developed, base broad, extending completely over eighth sternum and to anterior margin of ninth, apex more darkly sclerotized, terminating in a narrowly rounded tip (Fig 6).

Diagnosis. *Soyedina merritti* has a large, broad epiproct which separates it from all other *Soyedina* species. The paraprocts are saber-like with pointed tips and differ from *S. carolinensis*, *S. washingtoni*, and *S. vallicularia*, which have blunt tips. *Soyedina kondratieffi* has pointed paraprocts but they are more elongate and sickle-like with a distinctively concave inner margin that ends in a sharply curved apex. In addition *S. kondratieffi* has a short, stout epiproct.

Material. Holotype male, Pennsylvania, Westmoreland County, Maul Spring, Powdermill Nature Reserve, 19 March 1975, R.W. Baumann, O.S. Flint, Jr. and J.L. Sykora, deposited at the United States National Museum, Smithsonian Institution, Washington, D.C. Paratypes: Pennsylvania, Westmoreland Co.: 1 male, Powdermill Nature Reserve, 3 May 1957 (CMNH); 1 male, 14 March 19??, (CMNH); 1 male, same data as holotype, 21 April 1994, S.A. Grubbs; 4 males and 1 female (allotype), spring-fed stream into Powdermill Run, Powder Mill Nature Reserve, 3-8 April 1993, S.A. Grubbs; 1 male, 1 May 1993, S.A. Grubbs; 3 males and 2 females, 4 April 1994, S.A. Grubbs; 3 males and 2 females, seep into Powdermill Run, Powdermill Nature Reserve, 1 April 1995, S.A. Grubbs, M. Gray and P. Trieu; 1 male and 1 female, seep into Indian Creek, Rt. 381, 1/2 mile north of Rt. 31, 7 April 1995, J.I. Earle and S.A. Grubbs (JEC). Paratypes deposited at the following places: Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah; C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado and the personal collection of S.A. Grubbs.

Etymology. This species is named in honor of Dr. Joseph P. Merritt, Director of the Powdermill Nature Reserve. Dr. Merritt has been an outstanding supporter of the junior authors' research activities.

Discussion. *Soyedina merritti* is presently known only from springs in and near the Powdermill Nature Reserve in Westmoreland County, Pennsylvania. Additional collecting in nearby states could expand the range of this distinctive species.



Figs. 1-3. *Soyedina kondratieffi*. 1. Male genitalia, dorsal view. 2. Male genitalia, lateral view. 3. Female genitalia, ventral view. Figs. 4-6. *Soyedina merritti*. 4. Male genitalia, lateral view. 5. Male genitalia, dorsal view. 6. Female genitalia, ventral view.

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